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FLORIDA PESTICIDE RESIDUE WORKSHOP 2009

CHEMICAL ASPECTS OF BIOTECHNOLOGY/MOLECULAR BIOLOGY

CHEMICAL CHANGES INDUCED BY PROCESSING/STORAGE

CHEMICAL COMPOSITION OF FOODS/FEEDS

CROP AND ANIMAL PROTECTION CHEMISTRY

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SYMPOSIUM INTRODUCTION

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Emerging Pesticide Residue Issues and Analytical Approaches†

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The 46th Annual Florida Pesticide Residue Workshop of 2009 (FPRW 2009) held in St. Pete Beach, FL, is the latest in an annual tradition drawing scientists from U.S. federal and state government laboratories, industry, and other laboratories worldwide. In 2009, selected FPRW presenters were invited to contribute to this special issue of the *Journal of Agricultural and Food Chemistry* with a section devoted to emerging pesticide residue issues and analytical approaches. What follows is the written record of what should become a scientific conversation launched at FPRW 2009. There are two distinct approaches to organic residue analysis: instrumental methods and assays. In much of the world, scientists primarily rely on laboratories equipped with instrumentation for analysis, usually gas chromatography and liquid chromatography with some type of selective detector. In the discussion of instrumental approaches, the focus is on chromatography with mass spectrometry as a detection method. Approaches such as biomonitoring and assays fall outside the traditional instrumental method approach to residue analysis. Assays that do not require laboratory equipment are of greater interest for screening and are well-suited to field use. Regardless of the analytical method, the success of multiresidue analysis relies on the appropriate choice of sample preparation and cleanup methodologies. Many new sample preparation and cleanup approaches used for pesticide and other small molecule contaminant residue analyses in a variety of complex sample matrices are discussed in this special issue. The goal of these approaches is to reduce overall analysis time and solvent consumption without compromising the analytical results.

KEYWORDS: Pesticide residues; organic residue analysis; instrumentation; bioassay; chromatography; mass spectrometry

INTRODUCTION

The primary driver behind residue analysis remains regulatory compliance. To ensure the economic success of a crop or food product in a particular market, the local requirements for maximum residue levels (MRL) for a variety of pesticides must be met. Additionally, the methods used to determine the presence or absence of chemical residues at the legally acceptable limit must meet the standards set by law. Every region and nation has its own approaches to this. In the European Community, the levels and performance criteria of methods are proscribed by EC law. In the United States, many methods are proscribed as well. Because of the wide variety of complex sample matrices, it is the challenge of the analytical chemist to develop analytical approaches to meet or exceed the requirements with regard to the detection of analyte and method sensitivity of whatever legislation they are bound to follow. For this reason, selected papers from the 46th Annual Florida Pesticide Residue Workshop of 2009 (FPRW 2009) held in St. Pete Beach, FL, highlighting the emerging pesticide residue issues and approaches are included in this special issue to publicize the analytical challenges and describe successful approaches. What follows is not an in-depth review of pesticide residue analysis, but rather a brief introduction and background to the most successful approaches and important issues in pesticide residue analysis, chiefly chromatography–mass spectrometry, biomonitoring, and sample preparation, for the purposes of putting the FPRW 2009 scientific dialogue into context.

CHROMATOGRAPHY–MASS SPECTROMETRY

There are approximately 1000 pesticide active ingredients, recognized worldwide, with more than 500 pesticides and metabolites registered and regulated in the United States (*1*–*4*). These include the applied active ingredients and their respective degradation compounds. Methods are sensitive not only to the target analyte(s) but also to the food matrix in which they are found (*5*). Prior to the mid-1990s, the number of samples to be analyzed using a relatively costly chromatography–single-stage mass spectrometry detection method drove the analytical community to explore less costly affinity binding assays for single analytes. However, as the number of residues analyzed per commodity has increased, more and more methods are chromatography–mass spectrometry-based multiresidue methods relying then on the

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